Data

Crankshaft standard dimension and repair stages	Crankshaft bearing journal dia.	Fitted bearing Pertinent thickness of thrust washers	Width of journal	Crankpin dia.	Width of pins
Standard dimension	69.96 / 69.95	2.15	34.00 / 34.03	51.96 / 51.95	32.00 / 32.10
		2.20	34.10 / 34.13		
1st repair stage	69.71 / 69.70	2.25 or 2.35 or 2.40	34.20 / 34.23 or 34.40 / 34.43 or 34.50 / 34.53	51.71 / 51.70	to 32.30
2nd repair stage	69.46 / 69.45			51.46 / 51,45	
3rd repair stage	69.21 / 69.20			51,21 / 51.20	
4th repair stage	68.96 / 68.95			50.96 / 50.95	

Permissible out-of-round of crankshaft journals and crankpins			0.005
Permissible conicity of crankshaft journals and crankpins			0.01
Permissible radial runout of flywheel flange			0.02
Permissible axial runout of fitted bearing			0.02
Fillets	on crankshaft bearing journals		2.5 to 3.0
	on crankpins		3.0 to 3.5
Permissible radial runout of crankshaft journals when mounted on outer journals		journal II, V	0.16
		journal III, IV	0.25
Scleroscope hardness of crankshaft journals and crankpins			55–74
Permissible unbalance of crankshaft			15 cmg

Note

The bearing journals of crankshaft are not inductance hardened similar to other engines, but are hardened in a nitride bath.

Contrary to inductance hardened crankshaft, a bath-nitrided crankshaft is hardened at its entire surface.

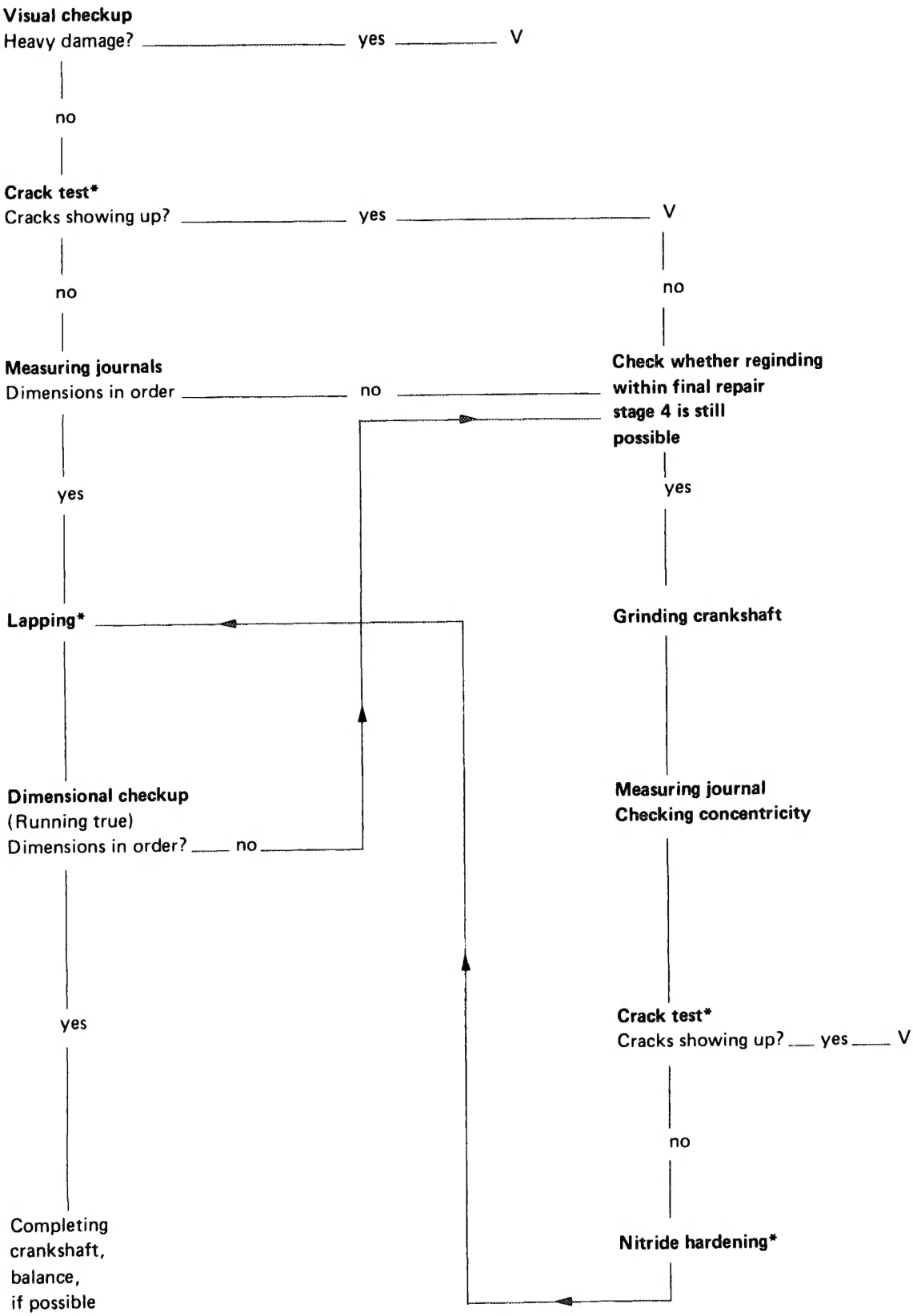
Conventional hardness tester (hardness drop tester) provides no information concerning proper hardness (depth of connecting layer) for crankshafts hardened in a nitride bath. No hardness test according to the above method is therefore required.

When testing and reconditioning crankshafts, proceed in sequence of diagram below.

Diagram

* Refer to section "Explanations Concerning Diagram"

V = scrap.


Visual checkup
Heavy damage?
yes
V
no
Crack test*
Cracks showing up?
yes
V
no
no
Measuring journals
Dimensions in order
no
Check whether reginding within final repair stage 4 is still possible
yes
yes
Lapping*
Grinding crankshaft
Dimensional checkup
(Running true)
Dimensions in order?
no
Measuring journal
Checking concentricity
yes
Crack test*
Cracks showing up?
yes
V
no
Completing crankshaft, balance, if possible
Nitride hardening*

Explanations concerning diagram

Crack test

Clean crankshaft. Bearing journals should be free of oil and grease.

Magnetize crankshaft and apply fluorescent powder (fluxing).

A color penetration test (immersion in bath or using spray can) may also be applied.

Aid: Paint or fluorescent powder
Cleaning agent
Developer

Hardening

Crankshaft must be nitride-hardened in a salt bath.

Attention!
Prior to nitriding, close all threaded bores in crankshaft.

Hardened threads will loose in strength and may therefore break out when tightening screws.

Screw-in necked-down screws on flywheel flange.

Screw-in a hollow center screw M 18 x 1.5 x 45 at front on crankshaft.

Center screw is bored hollow to prevent a chemical reaction in salt bath caused by the air which might be enclosed behind screw.

Duration and bath temperature are shown in nitriding specifications included upon delivery of nitriding equipment.

To avoid distorsion of crankshaft, suspend crankshaft vertically into nitriding bath.

Material data: 49 Mn VS 3 BY 80–95.

Depth of connecting layer: 0.014–0.022 mm.

Then cool crankshaft in oil or salt water to 90° C.

Upon nitriding, remove nitride residue in oil bores.

Attention!
Do not straighten crankshaft anymore after bath nitriding.

Lapping

Lap bearing journals with a lapping belt (grain 400) as follows:

Slowly pre-lap for approx. 5 seconds
Lap fast for approx. 25 seconds

Checking of hardness

Check nitrided bearing journals by means of metallographic etching.

Pertinent tests can be made on scrapped crankshafts.

Corrosion protection

Coat crankshafts which are not immediately installed again with engine initial operation oil (SAE 30).